PATENT SPECIFICATION

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COMPLETE SPECIFICATION.

Improvements in and relating to Wabbler Driving Mechanism.

I, WICHERT HULSEBOS, of Laren, near Hilversum, Holland, of Dutch nationality, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to a wabbler adapted to drive or to be driven by a shaft through bearings which are eccentrically mounted on and inclined with respect to the shaft. In known mechanisms of this character, such as disclosed by the Specification No. 183,488, the wabbler proper imparts its movement to the shaft through two eccentric bearings, which are inclined relatively to the axis of said shaft, to which they are rigidly secured. The movement is transmitted through ball bearings, but owing to the fact that such bearings, as a rule, are not adapted to withstand axial stresses, they are liable to rapid deterioration. This inconvenience has been met (see, inter alia, the Specification of British Patent No. 135,011) by supporting the wabbler in the direction of the axis of its eccentric bearings, but independently thereof, by members disposed on the shaft at the same inclination as said eccentric bearings. This construction, however, suffers from the drawback that the pressures between the wabbler and the said supporting members, such as ball bearings, may, owing, inter alia, to the unavoidable clearance in the eccentric bearings, locally rise to such a magnitude as to cause a breakdown.

My present invention, has for its object to overcome the last mentioned drawback and consists in a wabbler of the type first above referred to additionally connected to the shaft by a supporting member or members providing rotary and spherical freedom of motion but constraining the wabbler against motion in the direction of the axis of the inclined bearings.

[Price 1/-]

Further details of the invention will be described hereinafter with reference to the annexed drawing, in which Fig. 1 shows one embodiment illustrating the principle of my invention and Figs. 2—6 show five different embodiments thereof in axial sectional views.

Referring to Fig. 1, mounted at a suitable inclination on the shaft 1 are two eccentrics 2 and 3 in engagement with the wabbler 4, the latter being actuated, through knobs 5 and 6, by the pistons of cylinders (not shown). Intermediate between the eccentrics 2 and 3, the shaft 1 has a spherically enlarged portion 7 closely fitting within a correspondingly shaped annulus 8 provided with a centrally disposed flange 9. The said flange 9 projects into an annular recess or groove of the wabbler 4.

If a force P is applied to the knob 5, the wabbler 4 is pressed against flange 9 as shown and moves over the eccentrics 2 and 3 which, as will be understood, are not directly subjected to the force P, but only serve to transmit to the shaft 1 the moment due to this force P relatively to said shaft. If, as will practically always be the case, there is a certain clearance between the eccentrics 2, 3 and the wabbler 4, the annulus 8 will move over the spherical enlargement 7 of the shaft, until said clearance has been compensated for. Consequently, the wabbler cannot apply a moment to flange 9, so that the pressure between these parts will be uniformly distributed over their contact faces.

If the ball joint is subjected to the action of a force P_1 equal to P but acting in the opposite direction, a true moment is applied to the wabbler 4. This moment is transmitted in full to the shaft 1, through the eccentrics 2 and 3, whereas the flange 9 remains inactive, i.e., does not transmit any force to the shaft.

According to Fig. 2, the shaft 1 is not

provided with two ordinary eccentrics, but with a Z-crank, the webs of which are designated by 1^a, 1^b and the pin by 1^c. As will be understood, the cylindrical end portions of the crank pin 1^c are the mechanical equivalents of the eccentrics 2 and 3 shown in Fig. 1 and have, therefore, been designated by the same reference numerals. The wabbler and knobs are designated 4, 5 and 6, respectively. The flange 9, which fits in an annular recess of the wabbler 4, is connected to the shaft through a pin 10 passed through a hole in the crank pin 1^c, which hole flares from the centre towards either end, so that the pin 10 has freedom of limited oscillatory movement and the flange 9 has spherical freedom of motion. It should be understood, however, that the flange 9 only exercises this freedom when there is a certain clearance in the ball bearings 11, 12 interposed between the wabbler 4 and the eccentrics 2, 3 or when the amount of said clearance increases.

In Fig. 3 the end portions 13, 14 of the wabbler 4 engage the eccentrics 2 and 3, the contact faces being spherical. As a consequence, the wabbler fitted with gudgeon pins 5, 6 can move through a limited distance spherically, but cannot move axially, relatively to the eccentrics, so that also in this embodiment the ball bearings 11, 12 are relieved of axial stresses irrespective of the amount of clearance therein.

Fig. 4 shows a construction in which the flange 9 is rigidly secured to the eccentric 3 and, thereby to the shaft 1. This flange forms the central race for two series of rows of balls 17 and 18, the outer races of which, designated 15 and 16, engage the wabbler 4 by spherical faces so as to allow of a limited spherical movement of said wabbler actuated through the knobs 5, 6, while the said races 15, 16 as well as the flange 9 maintain an invariable position with respect to the shaft. The ball bearings 11 and 12 correspond to the similarly designated bearings of Figs. 2 and 3.

The embodiment shown in Fig. 5 is provided with a central, self-adjusting or aligning ball bearing, the inner race of which is held in its proper place by distance rings 20, 21 and has an invariable position with respect to the shaft 1. The outer ball race 22 is rigidly secured to the wabbler 4 and provided with a spherical tread for the balls 23, 24. This central ball bearing takes up axial stresses and at the same time allows of a limited spherical movement of the wabbler 4 fitted with the knobs 5, 6. The roller bearings 110 and 120 take the place of the ball bearings 11, 12 of Figs. 2 to 4.

The construction shown in Fig. 6 corresponds to that illustrated in Fig. 5 so far as it also embodies a central ball bearing adapted to withstand axial stresses owing to the grooves or treads in the ball races being exceptionally steep or deep. The inner ball race 25 is held in its proper place by distance rings 26, 27, and the outer race 28 is mounted in a ring 29 having a spherical face fitting against a spherical face of the wabbler 4, which, consequently, has freedom of limited spherical movement.

The engines for which the described wabbler driving mechanism have been devised will, as a rule, be so constructed that the wabbler is coupled to pistons on either side so that in normal operation the wabbler is subjected to a true moment and not to axial stresses. Stated in other language, the special means for taking up axial stresses are only operative when the pressures exerted by the pistons are unequal, or when one of the pistons make an idle stroke.

It goes without saying that the described wabbler mechanism can also be used when the shaft 1 is a power shaft for driving pumps, compressors or the like associated with the wabbler.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. A wabbler of the type adapted to drive or to be driven by a shaft through bearings which are eccentrically mounted on and inclined with respect to the shaft, characterised in that the wabbler is additionally connected to the shaft by a supporting member or members providing rotary and spherical freedom of motion but constraining the wabbler against motion in the direction of the axis of the inclined bearings.

2. A wabbler mechanism in accordance with Claim 1, further characterised in that the wabbler engages the supporting member or members through spherical faces.

3. A wabbler mechanism in accordance with Claim 1, further characterised by a ring intermediate between the eccentric bearings and mounted on the shaft in an inclined position relatively thereto, said ring forming the central race for two ball bearings, the outer races of which engage the wabbler through spherical faces.

4. A wabbler mechanism in accordance with Claim 1, further characterised in that the wabbler is supported by the

shaft through a radial, self-aligning ball bearing interposed between the eccentric bearings, said ball bearing comprising two rows or series of balls and a spherical tread in the outer ball race so as to be adapted to take up axial stresses.

5. A wabbler mechanism in accordance with Claim 1, further characterised in that the wabbler is supported by the shaft through a radial ball bearing comprising one row or series of balls and deep or steep grooves, the outer race of said ball bearing being provided with a spherical face fitting in a correspondingly shaped face of the wabbler.

6. A wabbler driving mechanism substantially as described and as illustrated in the accompanying drawing.

Dated this 26th day of March, 1925.

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Redhill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.—1926.

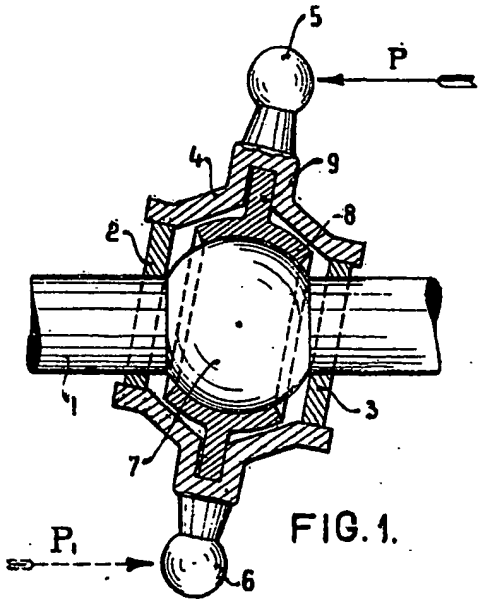

FIG. 1.

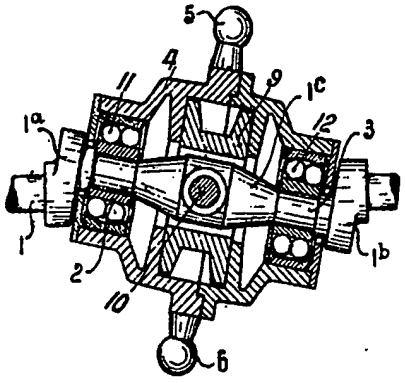

FIG. 2.

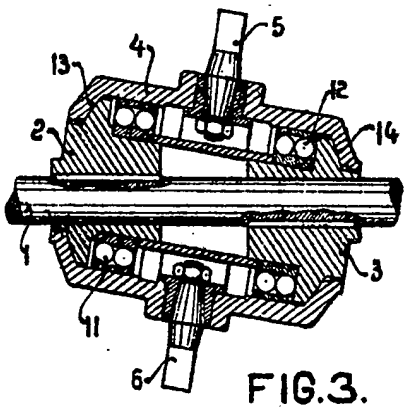

FIG. 3.

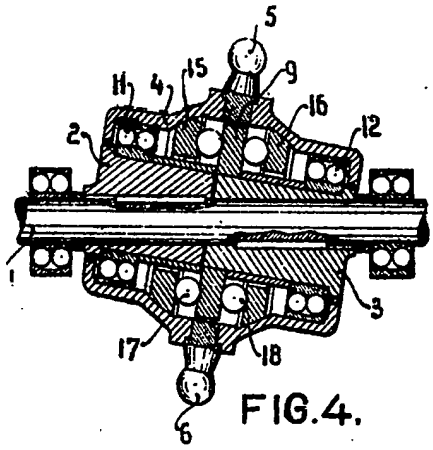

FIG. 4.

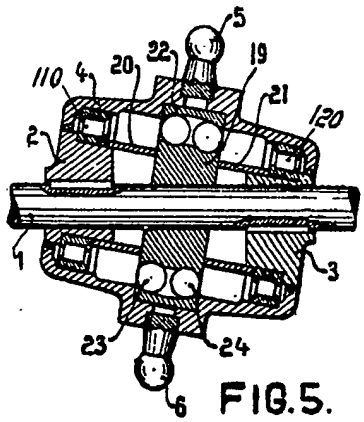

FIG. 5.

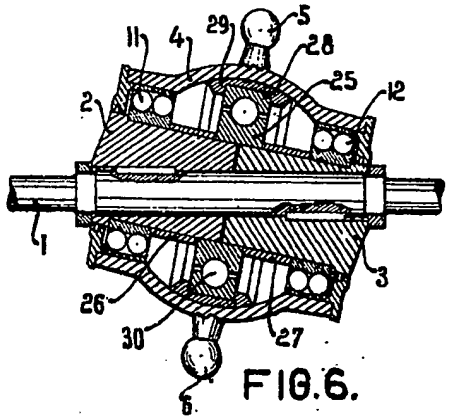

FIG. 6.

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